



## 6.4 - 6.5 Solving Inequalities

### Lesson 12

#### Connect

You may add any positive or negative number to both sides of an inequality

$$\begin{aligned} -2x &< 6 \\ \frac{-2x}{-2} &= \frac{6}{-2} \\ x &> -3 \end{aligned}$$

You may multiply or divide both sides of an inequality by any positive number.

$$\frac{x}{-3} < 6$$

*Shady mistake* **Watchout!**  
If you multiply or divide both sides of an inequality by a **negative number**, **reverse** the direction of the inequality sign.

$$\begin{aligned} -3 \left[ \frac{x}{-3} \right] &< 6(-3) \\ x &> -18 \end{aligned}$$

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#### Connect

#### EXAMPLE 1:

Solve:  $2x - 3 < 5x + 15$

$$\begin{aligned} -3 - 15 &< 5x - 2x \\ -18 &< \frac{3x}{3} \\ -6 &< x \\ \{x / x > -6, x \in \mathbb{R}\} \end{aligned}$$



#### Things to Remember:

- Did you isolate the variable?
- Do you have to collect like terms?
- Do you need to expand?
- Do you need to get rid of a fraction?
- Do you have to divide by the number in front of the variable?
- Did you multiply or divide by a negative number - therefore reverse the sign.

#### Practice

#### YOU TRY!

Solve:  $2x + 4 < 6x + 12$

$$\begin{aligned} 4 - 12 &< 6x - 2x \\ -8 &< \frac{4x}{4} \\ -2 &< x \\ \{x / x > -2, x \in \mathbb{R}\} \end{aligned}$$



#### Things to Remember:

- Did you isolate the variable?
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Connect

## EXAMPLE 2:

Solve:  $2(x-3) < 5(x+3)$ 

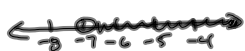
$$2x - 6 < 5x + 15$$

$$-6 - 15 < 5x - 2x$$

$$\frac{-21}{3} < \frac{3x}{3}$$

$$-7 < x$$

$$\{x/x > -7, x \in \mathbb{R}\}$$



## Things to Remember:

Did you isolate the variable?

Do you have to collect like terms?

Do you need to expand?

Do you need to get rid of a fraction?

Do you have to divide by the number in front of the variable?

Did you multiply or divide by a negative number - therefore reverse the sign.

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Practice

## YOU TRY!

Solve:  $-2(x-4) \geq 4(x+4)$ 

$$-2x + 8 \geq 4x + 16$$

$$8 - 16 \geq 4x + 2x$$

$$\frac{-8}{6} \geq \frac{6x}{6}$$

$$\frac{-4}{3} \geq x$$

$$\{x/x \leq -\frac{4}{3}, x \in \mathbb{R}\}$$

## Things to Remember:

Did you isolate the variable?

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Do you need to expand?

Do you need to get rid of a fraction?

Do you have to divide by the number in front of the variable?

Did you multiply or divide by a negative number - therefore reverse the sign.

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Connect

## EXAMPLE 3:

Solve:

$$\frac{1}{2}(2+5x) < \frac{2}{3}(15-3x)$$

$$6\left[\frac{1}{2}(2+5x)\right] < 6\left[\frac{2}{3}(15-3x)\right]$$

$$3(2+5x) < 4(15-3x)$$

$$6 + 15x < 60 - 12x$$

$$15x + 12x < 60 - 6$$

$$27x < 54$$

$$x < 2$$

$$\{x/x < 2, x \in \mathbb{R}\}$$

## Things to Remember:

Did you isolate the variable?

Do you have to collect like terms?

Do you need to expand?

Do you need to get rid of a fraction?

Do you have to divide by the number in front of the variable?

Did you multiply or divide by a negative number - therefore reverse the sign.

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Practice

## YOU TRY!

Solve:

$$\frac{1}{2}(2+3x) < \frac{2}{3}(5+2x)$$

$$6\left[\frac{1}{2}(2+3x)\right] < 6\left[\frac{2}{3}(5+2x)\right]$$

$$3(2+3x) < 4(5+2x)$$

$$6 + 9x < 20 + 8x$$

$$6 - 20 < 8x - 9x$$

$$\frac{-14}{-1} < \frac{-x}{-1}$$

$$14 > x$$

$$\{x/x < 14, x \in \mathbb{R}\}$$

## Things to Remember:

Did you isolate the variable?

Do you have to collect like terms?

Do you need to expand?

Do you need to get rid of a fraction?

Do you have to divide by the number in front of the variable?

Did you multiply or divide by a negative number - therefore reverse the sign.

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**Discuss****the ideas**

1. How is multiplying or dividing each side of an inequality by the same positive number different from multiplying or dividing each side by the same negative number?
2. What is an advantage of substituting 0 for the variable to verify the solution of an inequality? Can you always substitute 0?

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**Practice****CLASSWORK!**

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